DECLARATION

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF	: Kenji Todori et al.
SERIAL NUMBER	: 09/819,621
FOR	: OPTICAL DISK HAVING SUPER-RESOLUTION FILM
FILED	: March 29, 2001
GROUP ART UNIT	: 1756
EXAMINER	: Angebranndt, Martin J.

DECLARATION UNDER 37 C.F.R. 1.132

Assistant Commissioner for patents
Washington, D.C. 20231

Sir:

I, Kenji Todori, a co-applicant of the above-identified application, a national of Japan, declare as follows.

First, the following is explanation as to large influence of several percent of change in the transmittance of a super-resolution film on a beam diameter of laser beam.

Since the power characteristic of laser beams generally exhibits Gaussian distribution, the power density in a central portion of a laser beam greatly differs from that in a peripheral portion of the laser beam. However, transmittance characteristic of a beam is an integrated value of the whole beam. Therefore, even when the whole transmittance characteristic changes only by several percent, the transmittance greatly changes in the central portion of the beam having a high power density, although the transmittance hardly changes in the peripheral portion having a low power density. In particular, if the beams have a low transmittance characteristic, the beam diameter thereof is considerably narrowed due to several percent deterioration of the transmittance. Since the recording density is proportional to the square of a beam diameter, the recording density is greatly improved by beam narrowing.

As we stated in the previous Declaration as to the effect of the wavelength, $\chi^{(3)}$ (third-order nonlinear optical constant) is proportional to

the cube of A_{max} (exciton absorption peak wavelength), that is, the cube of $1/\omega_{ba}$ (where ω_{ba} is an angular frequency of the laser light). Further, the increment of the transmitted light, that is, the light quantity generated by third-order nonlinear polarization is proportional to the square of $\chi^{(3)}$. Therefore, the increment of the transmitted light is proportional to the six power of A_{max}.

Next, samples containing 3nm CdSe particles were prepared by the following method.

(1) CdSe particles having no organic group were prepared, in accordance with the method described in C. B. Murray et. al., J. Am. Chem. Soc. 115, (1993) p. 8706. As described on page 8707 of the same document, 3nm CdSe particles were selected by centrifugation.

As described above, according to Murray et al., it is possible to prepare CdSe particles having a desired size by a size-selective method. The 6.5 nm CdSe particles of Sample 2D in the present invention are prepared by the similar method.

(2) CdSe particles were refluxed in ethanol for 1.5 hours by the method described in F.Gindele et. al., Appl. Phys. Lett., 71, (1997) p. 2181. Thereafter, the particles were separated by centrifugation, and thereby 3nm CdSe particles having AMEO groups were obtained.

Two types of super-resolution films containing the above respective 3 nm CdSe particles obtained by the above method were irradiated with an incident beam having a power density of $1MW/cm^2$, and the beam sizes of the transmitted beams of the two films were measured. Attached FIG. 1 illustrates the result of the measurement. FIG. 1 illustrates the relationship between the normalized position and the normalized intensity. The lower drawing of FIG. 1 is an enlarged view of the part enclosed by broken lines in the upper drawing of FIG. 1.

The super-resolution film containing the 3nm CdSe particles having

no organic group of the above item (1) has a transmittance of 13.5%. In the meantime, the super-resolution film containing the 3nm CdSe particles having AMEO group of the above item (2) has a transmittance of 14.3%.

As shown in the lower drawing of FIG. 1, the reduction rate in the beam size in the super-resolution film of item (1) is 17.1 %, while the reduction rate in the beam size in the super-resolution film of item (2) is 19.5%.

Table 1 shows the increase rate in the recording capacity of each of the above samples, calculated based on the reduction rate in the beam size. As shown in Table 1, the increase rate in the recording capacity in the super-resolution film of item (1) is 45.5 %, while the increase rate in the recording capacity in the super-resolution film of item (2) is 54.3%. Therefore, the super-resolution film of item (2) is expected to have a recording capacity higher than that of the super-resolution film of item (1) by 8.8 %. In optical disks, the 8.8% difference in the recording capacity is considerably large.

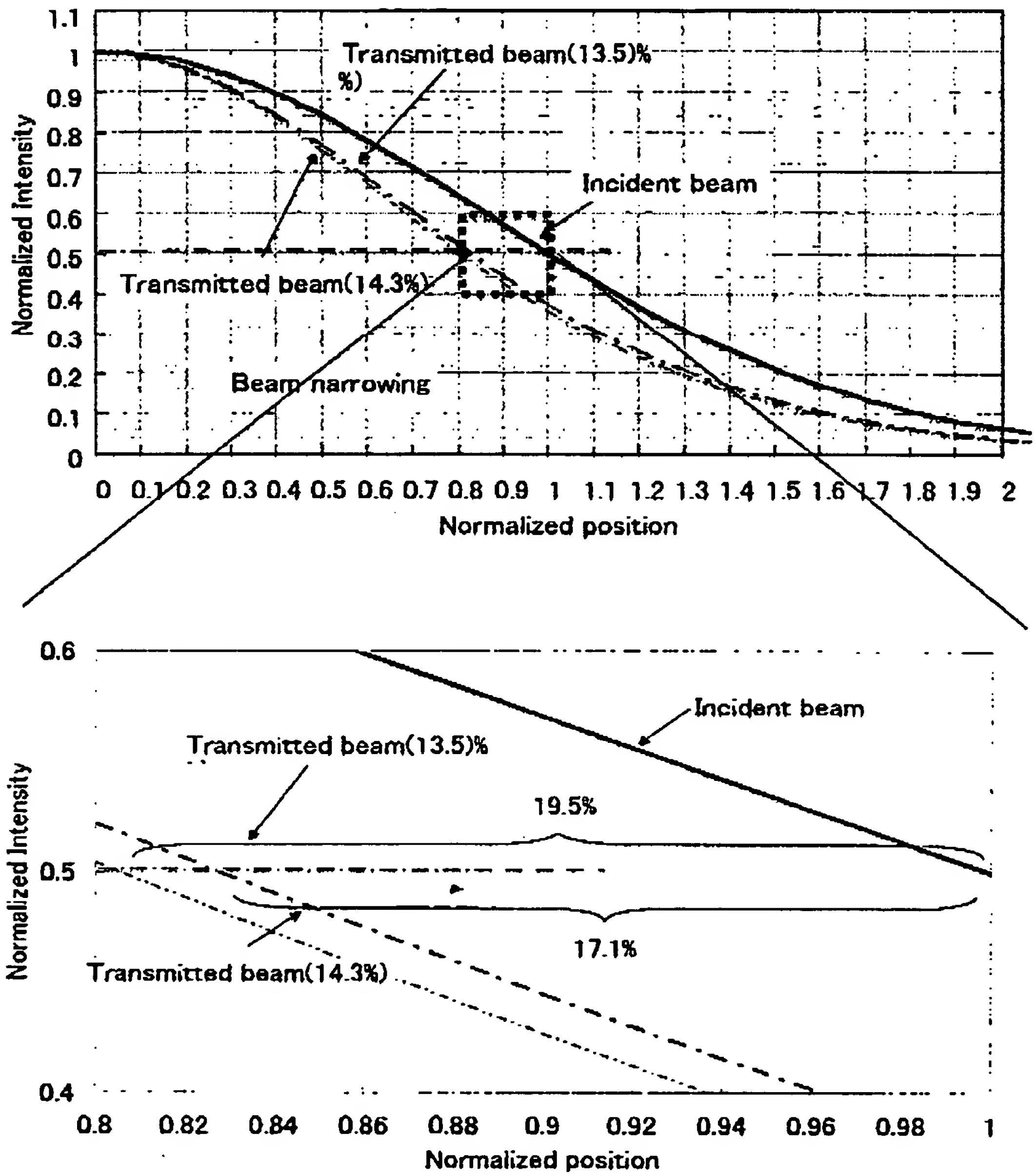
Transmitted beam(13.5)%
Incident beam
Transmitted beam(14.3%)
Beam narrowing
Normalized Intensity
Normalized position
Incident beam
Transmitted beam(13.5)%
19.5%
17.1%
Transmitted beam(14.3%)
Normalized Intensity
Normalized position

Table 1

Sample	Semiconductor	R	Size	Reduction rate in beam size	Increase rate in recording capacity	Difference in recording capacity
(1)	CdSe	-	3 nm	17.1%	45.5%	-
(2)	CdSe	AMEO	3 nm	19.5%	54.3%	8.8%

I, the undersigned, declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Date april 25, 2005

Kenji Todori

Kenji Todori

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Replacement Sheet

Table 2

Sample	Super-resolution film						Absorption saturation characteristics		
	Semiconductor particles				M	λ_{max}	λ	T	
	S	R	D_{mod}	D_{mod}/D_{Bohr}				$100kW/cm^2$	$1MW/cm^2$
2A	CdSe	AMEO	1.6nm	0.3	AMEO polymer	405nm	405nm	10%	16%
2B	$CdS_{0.1}Se_{0.9}$	-	1.0nm	0.21	PMMA	400nm	400nm	10%	13%
2C	$CdS_{0.1}Se_{0.9}$	-	1.3nm	0.28	PMMA	418nm	418nm	10%	16%
2D	CdSe	-	6.5nm	1.32	PMMA	640nm	640nm	10%	13%
2E	CdSe	AMEO	1.0nm	0.20	PMMA	400nm	400nm	10%	14%
2F	$CdS_{0.6}Se_{0.4}$	-	0.85nm	0.24	SiO_2	405nm	405nm	no change	

D_{mod}/D_{Bohr} represents a ratio of modal diameter D_{mod} of semiconductor particles to Bohr radius D_{Bohr} of the semiconductor.